

# Design, Working, Challenges, Applications, Advantages and Disadvantages of Li-Fi in Wireless Networks

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## ABSTRACT

This article demonstrates the definition of Li-Fi (Light Fidelity), its different applications, Advantages, Disadvantages as well as Challenges which would be great for an upcoming generation under wireless technology. The research is based on the various factors, consequences and risk factors associated with the advent of this field. This also demonstrates the communication of worldwide speaks with VLC. Li-Fi could be a wireless networking technology that's wont to transmitting data from one device to a different device. This research paper covers the applications of Li-Fi and compare with existing technology like Wi-Fi.

**KEYWORDS:** *Li-Fi, Visible Light communication, Wireless Sensor Network, WIFI (Wireless Fidelity)*

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## 1. INRODUCTION

Li-Fi is new a wireless technology that uses radio frequencies for data transmission. With the help of LED lights transmits data and communicate the devices wirelessly. This technology is faster than Wi-Fi technology.

Fi for transmitting the information. It can be also used in Smart Home, as Li-Fi cannot travel through transparent objects it provides secure data transfer as well as light.

Professor of Oxford University determines that the speed of Li-Fi increases up to 224Gigabyte per sec. We can download 18 movies in 1Sec. the Previous study, Apple looking for future version of iPhone that it can implement the Li-Fi capability in it. Li-Fi Dongle is newly invented by the company named as pure L- Fi.pvt.ltd.

According to some researches it is proved that Li-Fi can be used in different areas like Aviation Industry, Intelligence Transportation system Indoor navigation Stadium Petrochemical Plants.

In future Li-Fi would overcome all the limitations of Wi-Fi.

## 3. Design of Li-Fi: -

The Li-Fi consists of numbers of diode bulbs or Lamps. the varied completely different wireless devices like Cell phones, laptops, PC's, Internet-based devices to boot as server devices. There are 3 necessary factors in coming up with Li-Fi as follows:

- Line of Sight
- Represented of Light
- LED & the better performance use fluorescent light

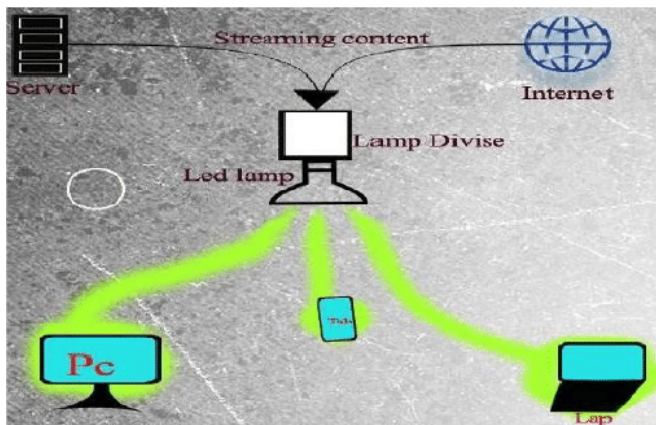


**Fig 1Li-Fi Bulb with LED Lighting**

(Source:<http://www.ijcta.com/documents/volumes/vol5issue1/ijcta2014050121.pdf>)

## 2. LITERATURE REVIEW:-

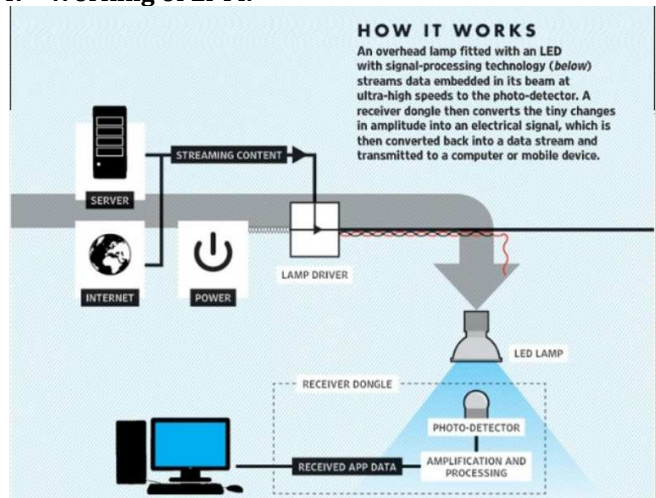
The additional points of Li-Fi are: It has speed 10 times faster than Wi-Fi. Also, it is highly secure because light inside the room will not go out if door is closed. Li-fi is used in Smart Cities using connected LED Bulbs. Aircraft uses the Li-



**Fig 2: Architecture of Li-Fi**

(Source:[https://www.researchgate.net/publication/295778250\\_A\\_Survey\\_on\\_LiFi\\_Technology](https://www.researchgate.net/publication/295778250_A_Survey_on_LiFi_Technology))

#### 4. Working of Li-Fi:-



**Fig4: Working of Li-Fi**

(<https://www.ijser.org/researchpaper/Light-Fidelity-The-future-technology-In-Wireless-communication.pdf>)

Li-Fi is a VLC wireless technology which transfer information through illumination takes place by taking the fiber optics associated with causation data through a light-emitting diode light-weight bulb whose intensity keeps on varied at a really high speed. This technology includes information that's unlicensed, thus it will be used for any application like streaming of video and music. It will access the web on a streetlight or will transfer a motion picture, music, images, videos from the lamp. This technology may virtually 'throw light-weight on' the way to meet the ever-increasing demand for high-speed wireless connectivity. rather than Radio waves, lightweight waves have replaced this technology referred to as Li-Fi. In this technology, LEDs should be switched 'ON' and 'OFF' at a quicker rate in order that even the human eye cannot detect. This will cause the light source to appear 'ON' continuously. The working of Li-Fi is very easy to understand. In Li-Fi System, there is a light emitter on one end (i.e.) an LED transmitter. The data input to the LED transmitter is encoded into the light that is based on Visible Light Communication, by changing the blinking rate at which the LEDs blink 'ON' and 'OFF' to generate different strings of 0s and 1s. Because the LED intensity is modulated very quickly that the human eye cannot detect. So the light-weight of the LED constant to which might alter the transmission of information within the light-weight form

According to the incoming binary codes: switching "ON" the LED implies logical '1' and switch "OFF" the LED implies '0'.



**Fig3: Li-Fi transmission**

(Source:<http://www.internationaljournal/IJECE/2015/Volume2-Issue3/IJECE-V213P07.pdf>)

#### 5. Advantages: -

Li-Fi is wireless technology, communication through LEDs and other different light-weight sources, which makes the general system at a low price.

1. Connectivity: With the help of light we can access internet in Classroom, Conference hall, Laboratories, Aircraft.
2. Capacity: - Light has 10000 times broad information measure than radio waves and a light-weight supply is formerly connected.
3. Efficiency: -As we know light absorbs less energy and it is highly efficient, data transmission is cheap as compare to LED's.
4. Availability: - Light sources are measure out each and every direction. Li-Fi can be implemented by commutation light i.e. bulbs by LED for higher transmission information.
5. Security: -Light waves do not access with walls and this technology cannot pass through transparent objects so data transmission is more secure. No one can misuse.

#### 6. Disadvantages: -

It is a unidirectional network that enables downloading however no uploading from the connected device.

1. The Light cannot access through walls and contains a mounted field process
2. Other light-weight sources except for Li-Fi design like LEDs, will limit the speed of information transmission.
3. Particle to particle communication is accessible.
4. This works only with a Horizontal/direct line of view.
5. Limited range of connectivity.
6. Unavailability of compatible technology.
7. Light interference and Light Pollution.

#### 7. Challenges: -

- Uplink
- Light off mode
- Light Interference
- LED Modulation Bandwidth
- Commercialization
- Backout Integration



**8. Applications: -**

- Li-Fi used light rather than radio frequency signals.
- No License is required for the Li-Fi.
- Millions of lamps can be transferred information.
- Underwater within the sea, Wi-Fi doesn't work on wherever Li-Fi can work.
- It uses radio broadcast Systems.
- Li-Fi can solve problems like the shortage of frequency information measures.
- It may be utilized in Medical instruments.
- It will use Li-Fi in hospitals and aircraft.

**9. Comparison Between Li-Fi and, Wi-Fi and other Radio Communication technologies**

Wi-Fi (Wireless Fidelity)	LI-Fi (Light Fidelity)
WI-FI is sending information to use of radio waves with the help of a Wi-Fi router.	LI-Fi transmits data using light with the help of LED bulbs.
Speed up to 2 Gbps can be achieved commercially	Speed of 1 Gbps is in use commercially
Short Frequency range 2.4GHz to 5GHz	Frequency range 10 thousand times more than radio waves
Wi-Fi has a range of 30 meters	Li-Fi Coverage distance of About 10 meters
Takes up more power to operate	Consumes less power
Wi-Fi signals cannot be blocked by walls so signal needs to use more secure technique to protect data	Cannot pass through walls, so data is protected and more secure
In Wi-Fi data can be transferred at 150Mbps with use of WLAN	In Li-Fi, data can be transferred at 1 Gbps

(Source:<https://www.google.com/search?q=difference+between+lifi+and+wifi&oq=di&aqs=chrome.2.69i57j35i39l2j0l3.8178j0j7&sourceid=chrome&ie=UTF-8>)

**10. Analysis: -**

By the previous history of researchers and research papers referred are able to perceive Li-Fi for smart simplicity. The papers define that Li-Fi is faster data transmission technology as compared to Wi-Fi, also it is bidirectional and fully broadband wireless technology. The comparison between Li-Fi and Wi-Fi technologies we come to know the features of Li-Fi over Wi-Fi. Light in windows, room, cars, lecture rooms can access wireless network. It is the great invention in wireless technology. Researchers Documents indicates that a future network goes to be faster but capability complications would possibly still keep. A Li-Fi access level can serve multiple users at constant time inside the planet of its quantity of cash. The communication is reliable, faster and more secure.

**11. Conclusion: -**

If Li-Fi comes into the image at intervals the longer term it would overcome. The all limitations of the native space network. The use of Li-Fi can replace radio-based wireless technologies. Li-Fi is free and provides a secure and safe internet facility. This technology helps to unravel the matter of a short radiofrequency system of measurement, ideas and points that square measure targeted feature and unit of measurement its consequences operative if this Li-Fi technology becomes powerful. This technology is placed to utilize, each bulb will give a one-factor style of a Wi-Fi hotspot to assist transmit wireless proceed toward the answer, safer and higher future.

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